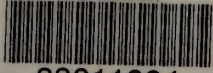


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# DEVELOPMENT OF ENERGY MINERALS IN NORTHWEST COLORADO

## Meeting of the National Advisory Council

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## DEVELOPMENT OF ENERGY MINERALS IN NORTHWEST COLORADO

### Overview

The northwest region of Colorado is presently experiencing a rapid industrial expansion due to energy minerals development. The greatest impetus stems from oil shale. As the pace quickens, problems associated with rapid development in a sparsely populated area are becoming more obvious and more critical.

The situation is complicated by the fact that other mineral resources are being developed in the same area simultaneously with oil shale. The most important minerals in the area other than oil shale are:

coal	uranium
oil and gas	nahcolite (associated with oil shale)
geothermal steam	dawsonite (associated with oil shale) sand and gravel

Other major associated projects that will proceed simultaneously with energy minerals development include product pipelines, power lines, water impoundments, diversions, pipelines and pumping plants; highways, railroads and by-product plants.

All of the above development activity is occurring in a sparsely populated and relatively undeveloped area which contains the following significant nonmineral resources which will be impacted:

- People
- Communities and towns
- Wildlife
- Water
- Recreation
- Wild horses
- Archaeology and historic
- Livestock forage

Anticipated population increases directly related to oil shale development alone are estimated at 160,000 or three times the present population of the three-county oil shale area. If only a fourth of this increase locates in Rio Blanco County, where most of the rich oil shale is, it will result in a ten-fold population increase. All of the towns in the area except Grand Junction have less than 5,000 population. Their ability to absorb and accommodate the forthcoming population increases is of great concern in Colorado.

Approximately 38% of the seven-county northwest region of Colorado and nearly 80% of Piceance Creek Basin is National Resource Land managed by BLM. In addition, the minerals on about 20% of the private lands are owned by the federal government and managed by BLM. Because of this land ownership pattern, energy mineral developments and/or their associated off-site facilities will be located primarily on NRL's. Similarly, urban expansion will involve NRL. BLM will be involved in nearly every development activity decision.

One of the most impressive things about energy minerals development in Colorado is the number of agencies, groups and firms involved. So far, over 280 have been identified. Several, such as BLM, USGS, EPA, Colorado Departments of Health and Natural Resources, Council of Governments and county commissioners have significant and continuing, though somewhat overlapping, responsibilities. Other agencies, such as Reclamation, HUD, HEW, SCS, Mines and Department of Transportation will be involved only at certain points. Environmental groups will, of course, monitor operations, impacts and decisions continuously.

To achieve the goals of energy production, environmental protection (surface resource management) and orderly community growth will require a great many well coordinated and timely actions by federal, state and local agencies and industry. The mechanism necessary to accomplish coordinated and timely action are not well defined or generally recognized at this time.

The challenge is to assess the resource potentials, identify and weigh the gains and losses, and make decisions or recommendations that, in balance, best meet the needs of the American people.

## Energy Minerals Resources

The northwest region of Colorado is rich in energy-mineral resources. (See Figure 1.) Development of any one or all of them represents a paradox of meanings. In relation to the national energy dilemma, development is heralded by some as a panacea. And in respect to industry, local governments, environmentalists, and to BLM, development represents a gargantuan problem in the area of planning, services and action vs. reaction.

Increased development of these minerals is already taking place. What impact this development will have upon the existing environment poses many questions. There is no single, simple answer. No one really knows the wide-ranging scope or complete timetable of development. The first step, however, must be in accepting the realization that any program of the magnitude promised cannot be looked upon as an isolated activity. All resources will feel the effects. (See Figure 2.)

### Oil Shale

The oil-shale reserves of the Green River Formation of Colorado, Utah and Wyoming is estimated to be 1,800 billion barrels of oil. Of this amount, about 84% of the known higher grade reserves (25 gallons per ton or greater) are located in Colorado. Even though Colorado has the smallest geographical area of oil shale, it has the richest, thickest and best defined deposits, and it is predicted that oil shale development will be greatest in Colorado.

The location, quantity and quality of oil shale in the Piceance Creek Basin have been known since the turn of the century. The technical feasibility of large-scale development has also been generally recognized. But the ability of oil shale to compete with conventional energy sources in a competitive market has been under question and the willingness of industry to invest large sums of money in shale oil production had not been demonstrated until January 8, 1974. On that day the first oil shale lease offer under the Departmental prototype program brought a high bid of 210.3 million dollars for Tract C-a and signaled the start of a new industry in Colorado in which BLM is going to be heavily involved. Altogether, BLM offered six leases in the three-state oil shale region. Two leases were sold in Colorado, two in Utah and none in Wyoming.

In Colorado, the size of the emerging industry and the impacts on the region and on resources administered by BLM can't be gauged by the scale and design of the two federal lease developments alone. Four additional developments on private lands have been publicly announced in Colorado since the first lease sale. Each of these operations will be about the same size as the federal lease operations and one of them, Colony Development Operation, will probably

be in production before the federal leases. In the Piceance Basin, alone, there are more than one-quarter million acres of privately owned oil shale land.

The following discussion summarizes oil shale activities in Colorado in terms of what is taking place in the Federal prototype leasing program and in the private sector.

### Federal Prototype Leasing Program

#### Tract C-a

This lease, containing 5,089 acres, was offered and sold to Standard/Gulf on January 8, 1974, for \$210.3 million. Estimated recoverable oil shale reserves within the tract are 4.07 billion barrels of oil in mineable beds containing 30 or more gallons per ton.

The preliminary development plan indicates a combination openpit and underground mine and an off-site processing plant. Average pit depth will be 1,000 feet. Indicated production capacity is 100,000 to 300,000 bbl/day. Work force estimates range from 2,000 to 4,000.

Processed shale disposal (up to 5,000 acres) and water storage (up to 4,730 acres) are planned off-site in drainages near the lease tract.

#### Tract C-b

This lease was offered on February 12, 1974. The high bid was \$117.8 million which was offered by a group consisting of Atlantic Richfield Company, The Oil Shale Corporation, Ashland Oil, Inc., and Shell Oil Company. Estimated recoverable shale oil reserves within this tract are 3.5 billion barrels in mineable beds containing 30 or more gallons per ton. The mining method proposed by the lessee is underground room and pillar. Production capacity is expected to be in the 50,000 to 100,000 bbl/day range, and employment is expected to be between 1,000 and 2,000. The plant facilities will be on-site, as will be nearly all of the spent shale disposal and reservoir sites.

The BLM and U.S.G.S. are the principal agencies involved in administration of activities connected with the leases. We are assisted by other agencies such as EPA, HEW, HUD, State Agencies and local governments. In addition, we receive advice on environmental matters connected with development activities from The Oil Shale Environmental Advisory Panel. This Panel was established by the Secretary of the Interior and is comprised of State, federal and private representatives. They are responsible for reviewing oil shale development plans and advising BLM, U.S.G.S. and the



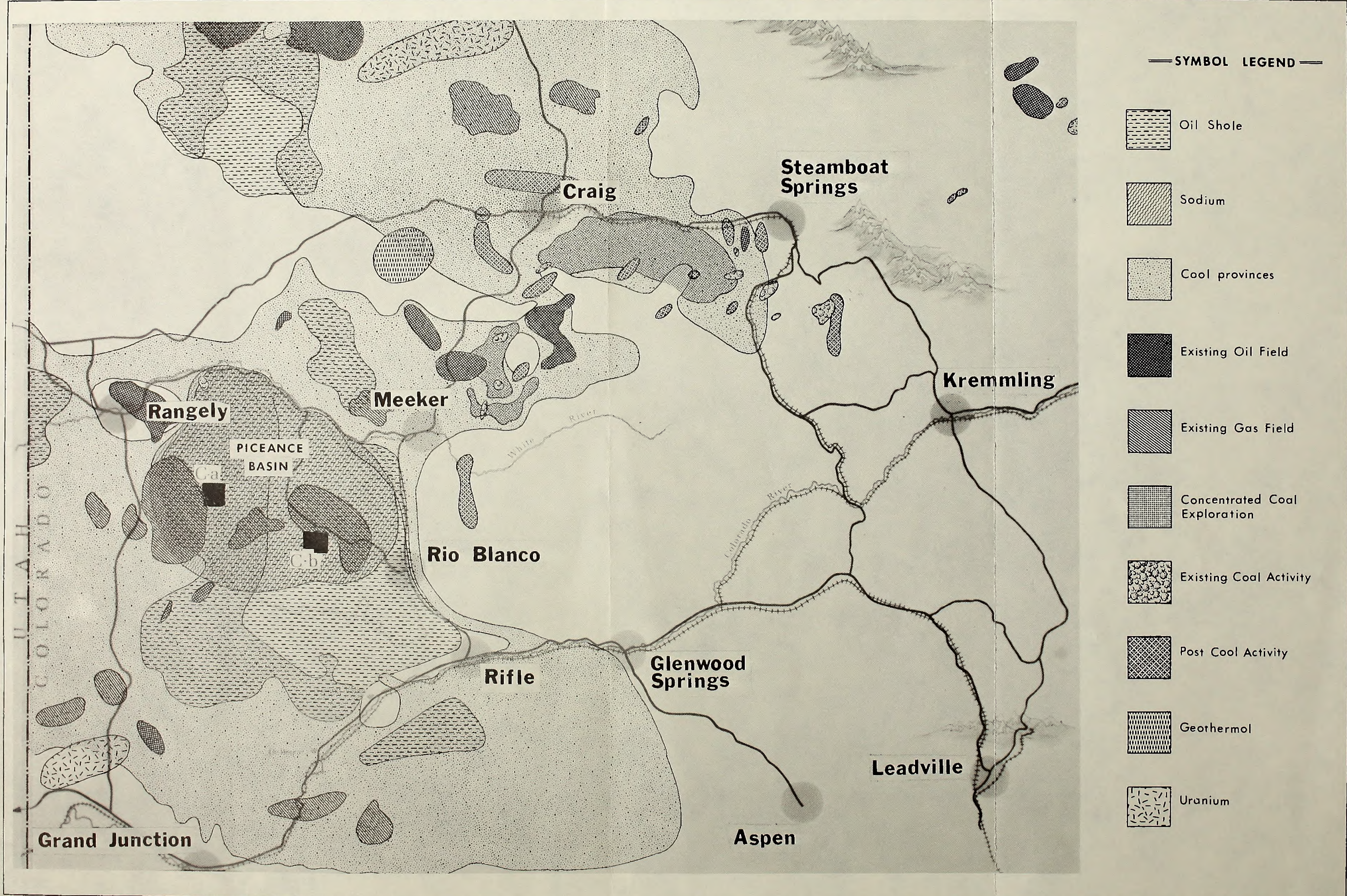


FIGURE 1—Locations of Energy Minerals in Northwest Colorado.



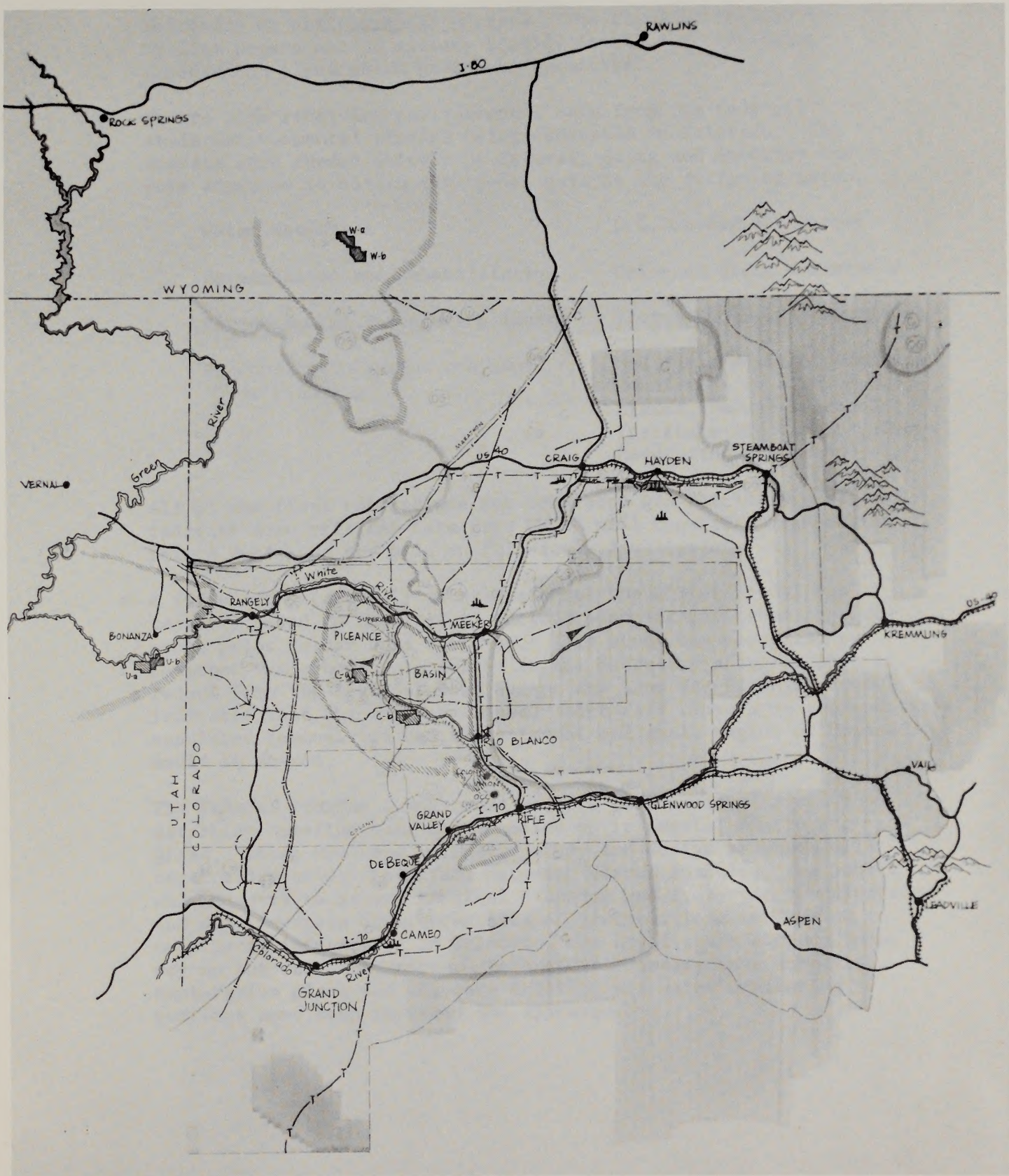


FIGURE 2—Present & Proposed Utility and Transportation Systems.



Secretary on environmental matters. The Panel is chaired by William Rogers and is already heavily involved in reviewing exploration plans which have been submitted.

We are also receiving environmental data from the four oil shale environmental studies being conducted in Colorado. The studies were funded jointly by Federal, State and Industry and were designed to obtain additional data in the following areas.

Water Resources	U.S. Geological Survey
Revegetation and Rehabilitation	Colorado State University
Environmental Inventory & Impact	Thorne Ecological Institute
Regional Development and Land Use Planning	Oil Shale Regional Planning Commission thru THK Associates, Denver Research Institute and Bickert, Brown Coddington and Assoc.

All of the final reports are not completed but the interim reports indicate some critical data gaps which will require consideration before decisions are made on full-scale development.

A fifth study (actually an extension of the RD&LUP study) was recently added to the list to include planning for urban requirements prior to tax base build-up. This study was requested by Governor Vanderhoof in a letter to the Secretary after an interim report from the Regional Development and Land Use Planning Study indicated that the monetary fiscal short-fall impacts on the sparsely populated communities and towns in the oil shale region of Colorado would be severe.

The Federal Program lease terms require environmental studies to establish baseline data and detailed environmental monitoring programs. These numerous intensive study and design programs will require day-to-day interface between federal agencies, the public and industry to assure parallel planning and area-wide coordination and consideration of alternatives of greatest long-term value to nonmineral interests. In Colorado, the studies are already under way on the two lease sites. Both of the lessees have submitted exploration plans and the core drilling and water monitoring portions have been reviewed and approved.

Environmental groups take an active interest in oil shale development in Colorado. Many are well informed and very effective in their operations. They have made important contributions to the prototype program, and will continue to monitor mineral operations. In effect, and correctly so, we and industry are operating in a "fishbowl". Judgment mistakes will be easily seen and severely criticized. Development of an oil-shale industry will depend largely on our ability to demonstrate to all segments of the public, that this industry can serve the nation without undue degradation of the environment.

#### Private Oil Shale Development Plans

Colony Development Operation has announced plans to go into commercial production on patented lands near their "semi-works" plant on Parachute Creek near the southern edge of Piceance Creek Basin. An underground room and pillar mine and surface retort using the "TOSCO II Process" is planned.

Production capacity will be in the 50,000 to 150,000 bbl/day range. They expect to employ about 2,500 workers. On-site surface disposal of the processed shale is contemplated. They expect to be in production before 1980. Colony has announced plans to construct a company town that will accommodate 5,000 people near the existing town of Grand Valley. We are currently doing an EIS which includes consideration of their pipeline R/W and commercial plant facilities. A draft of the EIS is expected to be completed in December, 1974.

Union Oil Company has announced plans to develop a commercial operation of about the same type and scale as Colony and in the same vicinity.

Superior Oil Company plans to develop a combination oil shale-nahcolite-dawsonite operation on the northern edge of the basin as soon as they are able to consolidate their land holdings through an exchange they are proposing. The scale would be similar to Colony and Union but employment would be less and all processed shale would be backfilled into the mine voids. They claim they can mine the shale without disturbing the large zone of saline water in the Basin. They have a field office in Meeker near the development site and are actively engaged in predevelopment engineering and negotiations on land exchanges, etc.

Occidental Oil Shale, Inc. is actively engaged in a pilot operation on a 4,300-acre tract in the Roan Creek drainage near the southern edge of the basin. They have stated publicly that they expect to go commercial on this tract if they are unsuccessful in acquiring a Federal lease. They have a unique in-situ process that involves limited underground mining, requires practically no water, produces surplus electrical power and requires very little surface disposal of mine waste (no processed shale disposal).

The Bureau of Mines' Anvil Points oil-shale research facility is active again. Fifteen major oil companies have contributed \$500,000 each to share in a demonstration program known as the Paraho Oil Shale Project. It involves testing the applicability to oil shale extraction of a retorting process used in calcination of limestone. The eventual target of the program is the rich oil shale deposits in Colorado and Utah. (See newspaper reprint.)

Private Ownership. There are over 200,000 acres of land in the Piceance Creek Basin owned by various oil companies, the owners of which may enter the development picture in the near future. We have been contacted by nine of these companies, including the two previously mentioned, regarding land exchanges. Their objective is to block up their holdings into economical, mineable units.

In Summary, the current oil-shale picture is this:

1. Oil-shale reserves on public and private lands in the Piceance Creek Basin will be developed by the emerging oil-shale industry.
2. We are involved with much more than a prototype program due to recent interest by industry in developing private holdings.
3. Impacts and workloads will stem from operations on both Federal and private lands. BLM will be heavily involved since about 80% of the oil shale area is under its jurisdiction.
4. There is deep citizen and political concern regarding environmental and socio-economic impacts resulting from oil shale development.
5. Additional research needs to be done to fill data gaps identified through ongoing studies.
6. Industry is testing the feasibility of several types of extraction methods, some of which may facilitate shale oil production at a faster rate than anticipated. In addition, some may cause less environmental degradation.
7. Development of the industry will depend largely on our effectiveness in working with environmental groups, advisory panels, state and local governments, other agencies and industry.
8. Oil-shale development will generate many off-site activities and impacts. It cannot be developed independently. Orderly and timely development will depend greatly on meshing oil shale industry needs with those of other minerals and resources, including human resources.

PARAHO PROJECT

**Business — Finance**

**Test Oil Flow at Shale Plant Foretells Great Future**

By WILLARD HASELBUSH  
Denver Post Business Editor

ANVIL POINTS, Colo. — Petroleum of rich quality, full of valuable, easy-to-recover by-products, is flowing from an oil shale plant in western Colorado.

Actual production of oil from shale beds of the Piceance Basin, northwest of nearby Rifle, Colo., started less than three months after formal startup of the long-heralded Paraho Oil Shale Demonstration Project.

Representatives of The Denver Post were there as operators ran the project's 10½-foot-diameter semi-work's retort through a full "hot-flow" test.

**Darker and Thicker**

The resulting oil was darker and much thicker than the usual crude produced from wells. Oil from shale, the operators said, has a pouring point of 80 degrees Fahrenheit.

Questions about that led to a series of revelations about what Paraho's executives say will be a full-scale oil shale in-

dustry in western Colorado by the early 1980s at the latest.

Here are highlights:

The 17 major corporations which guaranteed up to \$500,000 in cash each to finance the \$7.5 million Paraho Test do not plan creation of a large new refinery industry on the Western slope. That's because it would require too much water. Instead, they plan a series of "upgrading plants."

These plants—to be located near reorting centers—would remove nitrogen compounds from the heavy, hard-to-pour oil.

**Produce Ammonia**

This process will produce ammonia for fertilizer, turn part of the shale oil into gas for generating electricity, convert part of it into sulphur for sale to an always-eager market, and make the rest thin enough for transmission by mostly existing pipelines to the refinery complexes in the Midwest and on the Gulf Coast.

Harry Pforzheimer, vice president of Sohio Petroleum Co. and chairman-direct-

or of the experiment at the Anvil Points facilities leased from the U.S. Bureau of Mines, says he is convinced Paraho retorts—used in groups of 12 to 14 per 100,000-barrels-per-day plants—can be the basis for a commercial oil-shale industry turning out 2 million barrels a day on Colorado's Western Slope alone.

His figures don't include the rich shale deposits of Utah and Wyoming.

Pforzheimer and John B. Jones Jr. of Denver, head of Paraho Development Corp. and inventor of the process, said mineable shale within 250 miles of the test area northwest of Rifle could fuel the new industry "for at least a century."

Edwin M. Piper, operations manager at Anvil Points, says the Paraho process has two outstanding features—It uses no water and it needs no fuel.

"This sort of blows some critics of oil shale out of the saddle," Piper said. "And it adds materially to our low-cost economics."

Piper explained that oil shale has a residue of carbon after it's mined and crushed to the three-inch to one-fourth-inch size used in the Paraho retort.

"It's also loaded with kerogen; you can light it with a paper match and it will keep on burning unless you control it."

Jones, process inventor, said the only water Paraho uses in converting shale to oil is in the mining process, in disposal of retorted shale, and in revegetation as required.

According to Jones, top secret of Paraho is the amount of air mixture and the point at which it is injected into the retort.

"That's why, already producing oil,

we'll run the experiment into February 1976," he said. "We must make certain we develop the correct kiln formulas to insure maximum recovery of the products our 17 sponsoring companies want."

All three Paraho project executives said problems of disposing of retorted shale "seem pretty well solved already in the laboratory and we'll move into the field next spring for proveout."

Pforzheimer said retorted shale tends to expand "so it wouldn't be possible just to push all the waste back into the mine shafts—not nearly enough room."

But he added tests show several profitable commercial ways to use the retorted shale for more than landfills. One possible use, he said, involves ground stabilization for heavy construction, another: road building."

Other side benefits can be enormous, he said, "as vital to some as our main goal of helping ease the energy shortage."

One of these, he said, is underlined by the projection that a single 100,000-barrel-a-day Paraho plant could, in addition to oil and gas production, provide more than 70 per cent of all fertilizer needed in seven surrounding Western states.

**Others Named**

Besides Sohio, firms financing Paraho include Atlantic Richfield, Carter Oil Co., Chevron Research Co., Cleveland-Cliffs Iron Co., Gulf Oil Corp., Kerr-McGee Corp., Marathon Oil Corp., Arthur G. McGee & Co.

Also, Mobil Research, Phillips Petroleum, Shell Development, Southern California Edison, Standard Oil (Indiana), Sun Oil Co., Texaco, Inc., and the Webb Chambers-Gary-McLorraine Group.



## Coal

### Present Situation - Production

There are presently eight active producing coal mines in the north-western area of Colorado. These mines produced approximately 2.8 million tons of coal in 1973.

About 90% of the coal production was from the four surface coal mines operating in the Mt. Harris-Oak Creek Areas of Routt County. Essentially, all the surface mined coal was used for electric-power generation. A small part was used commercially in sugar plants and for other minor uses.

Underground mines are operating at Oak Creek in Routt County, about 81 miles south of Craig and at Axial in Moffat County, and about 9 miles north of Meeker in Rio Blanco County. Underground mined coal is used for various purposes--electric-power generation, commercial-heating processes, and domestic heating.

### Planned Growth - Mining (Strip operations)

Peabody Coal Company has submitted plans for the expansion of their existing strip operations on their existing lease.

Energy Minerals Corporation has submitted two plans for expansion of their existing strip operations on their existing lease.

Grace and Company is currently doing exploration drilling on their existing lease.

Utah International is currently doing exploration drilling on their existing lease. They will supply the coal for the two Colorado Ute power operations. The first operation is planned for 1978--the second in 1979. They estimate their coal needs to be 99 million tons for the 35-year life of the projects. This amounts to approximately 2.8 million tons per year.

Kemmerer Coal Company has completed exploratory drilling on their prospecting permit. They are in the process of filing for preference right lease.

Consolidated Coal Company is expected to commence exploratory drilling on their existing lease within five months.

Pittsburg Midway has submitted plans for the expansion of their existing strip operations on their existing lease.

## Planned Growth - Power Plants and Related Facilities

Hayden II power plant expansion is in the construction stage.

Utah International's Craig power station is in the construction stage.

Williams Fork power station site is expected to be chosen within three months. The company is presently completing the Impact Analysis for a site location.

Juniper Dam is in the final stages of planning. \$60,000 has been authorized for engineering on this project.

Savory Pot Dam is in the pre-construction planning stage with pressure to speed development.

White River power station is in the pre-construction planning stage. The engineering drilling has been completed. There is pressure for construction due to oil shale development.

## Planned Growth - Miscellaneous Projects

All of these are in the pre-planning stage with pressure to construct.

### Railroads

A line from Craig to Utah International's Craig steam plant.

A line from Craig to Axial Basin to service W. R. Grace and Company. This line would be extended from Axial Basin to Meeker and then to Rifle.

Extension of the existing line from Craig through Crescent to Baggs, Wyoming, to tie up with the Union Pacific railroad.

### Powerlines

A line between Craig and Hayden.

Lines from Craig going both north and south. These will tie to existing and/or proposed power stations.

### Predicted Growth

Rate of coal production from northwestern Colorado is expected to double within the next two years. By 1980, coal production should be about six times as great as the 1973 production.

Most of the immediate growth within the next two years will be concentrated in the presently active surface mining area between

Mt. Harris and Oak Creek. It will consist of extending and expanding existing surface mines. Major growth beyond two years will spread westwardly along the Williams Fork Mountains in Routt & Moffat Counties and then southwardly to the Nine-mile Gap Area in Rio Blanco County.

A large new surface coal mine (production 500,000 tpy or more) will be developed south of Hayden in 1976-77 to supply coal to the Hayden Power Plant addition. Construction will start in 1975 by Utah International on a new power plant and large surface coal mine about six miles south of Craig. Coal production is expected from large new surface or underground or combination surface-underground mines in the Axial-Ninemile Gap Areas before 1980. Most of the early increased production from the Axial-Ninemile will probably be shipped for out of area powerplant use. However, since this area contains huge reserves of good quality coal, it seems reasonable to expect plans before 1980 for power generation or perhaps even coal conversion in the Axial-Ninemile Area.

New coal production of up to 3/4 million tons per year is expected from new medium speed (production 500,000 tpy or less) underground mines in the Cameo Area, Mesa County, about 15 miles east of Grand Junction by 1980. One new mine at Cameo is being developed, but has produced no coal to date.

Development of several coal leases north and east of Rangely is also expected by 1980. Coal will be underground mined and will probably supply a medium size electric powerplant that has been considered for the mine location along the White River.

Some increase in the number and production of small underground mines (production 50,000 tpy or less) in NW Colorado is expected. No specific new proposed sites are known at this time.

The following table gives projected coal production for NW Colorado through 1990:

<u>County</u>	<u>1975</u>	<u>Million Tons Per Year</u>		
		<u>1980</u>	<u>1985</u>	<u>1990</u>
Routt	5.1	7.3	11.0	13.0
Mesa	0.2	0.7	1.0	1.4
Moffat	0.5	7.4	7.9	8.3
Rio Blanco	0.2	3.7	8.4	9.2
Total	6.0	19.1	28.3	31.9

Thick beds of lower grade coal north and west of Craig are not being developed at the present time. Plans to develop this coal are not known at this time; however, there may be considerable

surface mineable reserves in the area, and it seems probable that great interest will develop prior to 1980. These and all other coal reserves in NW Colorado would be considerably more valuable if a railroad spur line were extended southwardly from the U.P.R.R. line at Creston Junction, Wyoming. The development of oil shale, nahcolite and dawsonite in the Piceance Basin will undoubtedly accelerate the plans for such an extension.

The anticipated growth will greatly increase exploration, development drilling, and road building.

## Oil and Gas

### Present Situation

There are 675 producing oil and/or gas wells in the area, comprised of Routt, Moffat, Jackson, Rio Blanco and Garfield Counties.

These wells are producing 20 million barrels of oil and 26 million cubic feet of natural gas yearly. Approximately 63% of the oil and 84% of the natural gas is produced from Federally owned petroleum resources. The oil production amounts to approximately 50% of that produced in the entire State of Colorado. Active seismic operations for oil and gas are being carried on with 300 miles of new trails having been constructed during the past year. There have been 150 drilling plans received during the past year.

### Predicted Growth

The increasing number of notices of intent to conduct oil and gas exploration (seismic) and drilling plans received are clear indications of expanding interest in this area for oil and gas development. It is reasonable to expect a 10% increase in oil and gas activity per year in this area for at least the next few years.

It can be expected that projects similar to Rio Blanco for gas stimulation will be accelerated. Although there is no positive indication at the present time that such tests will result in increased production of natural gas, the impacts of the projects are present and will increase. If the tests are successful, the impacts will be even greater.

## Bituminous Sands

### Present Situation

Preliminary geologic investigations have delineated several areas of NW Colorado, which are potentially valuable for bituminous sands. Most of the deposits are along the Grand Hogback and the Danforth Hills, and are low grade.

There are no known valuable deposits, and there is no known present interest in developing the deposits.

#### Predicted Growth

As technology is developed and petroleum resources are depleted, development of bituminous sands will become a reality.

#### Geothermal Steam

##### Present Situation

Three areas in NW Colorado have been designated as potentially valuable for geothermal resources. One is the Juniper Springs area along the White River in Moffat County. The other two are in Routt County, at Steamboat Springs and between Milner and Mt. Harris.

##### Predicted Growth

The 64 applications for geothermal steam leases which we recently received is a clear indication of the accelerating interest in this resource in Colorado. Interest will increase, and this area is a prime target.

#### Uranium

##### Present Situation

At the present time, we have 45 applications for prospecting permits to explore for uranium and associated minerals (gold, platinum, silver, etc.) on acquired lands in this area.

##### Projected Growth

Since uranium has been discovered in this area, although not developed, we can expect an increase in activity as the building and operation of nuclear plants increases. It is predicted that the building of such plants must increase to meet the energy needs.

#### Other Minerals

##### Nahcolite and Dawsonite

##### Present Situation

Interior has issued 4 sodium leases and has an additional 4 lease applications pending, covering these minerals in the Piceance Creek Basin. The leases are within three miles of oil shale lease C-a

and about 10 miles from oil shale lease C-b. The lessee is conducting economic, mining, processing and market studies and has definite plans for development of the leases at this time. No work is being done on the lease lands, but the lessee contacted this office recently regarding permits needed for exploratory and development work.

It has been reported that Superior Oil Company will produce nahcolite and dawsonite in their private land oil shale development.

### Predicted Growth

As the use of coal increases, the development of the nahcolite can be expected to increase for its use as a stack scrubber in pollution control.

Since we currently import 90-95% of our aluminum, the development of dawsonite is expected to become critical. Indications are that foreign exporters are possibly thinking strongly about taking the same line as the foreign oil producers have recently taken. This would accelerate the development of dawsonite.

### Sand and Gravel

#### Present Situation

High demands are being put on sand and gravel, especially in Rio Blanco County where sources are scattered, and in short supply. Several of the known sources are situated on national resource lands. Rio Blanco County has applied for a site on the White River where they propose to excavate 100,000 cubic yards of gravel. The Town of Rangely has been granted a permit to excavate gravel immediately east of the townsite. Several other counties (Moffat, Grand and Jackson) have expressed interest in obtaining permits to excavate or establish pits on national resource lands.

#### Projected Growth

As the development of the previously discussed mineral resources increase, the demand for sand and gravel will increase in like proportion. Delineation of sites for obtaining this resource will become more critical.

## Other Resources

### Wildlife

#### Present Status

A wide diversity of wildlife inhabit the region, including mule deer, elk, buffalo, sage grouse, bald and golden eagles, prairie and pregrine falcons, sandhill cranes and sage grouse. The mule deer herd in the Piceance Creek Basin is estimated at 20,000 and is the largest wintering deer herd in North America. At the present time, hunter expenditures, mainly for mule deer, are a primary source of income for Rio Blanco County. The deer herd attracts nationwide interest as evidenced by the fact that the area experiences around 27,000 hunter days with hunters representing 28 different states.

The buffalo herd in the basin is managed by the Colorado Division of Wildlife on an experimental basis at the Little Hills Experimental Station.

#### Predicted Impacts

Major public concern is for the future of the mule deer herd. Elimination of winter habitat, as well as increased human activity, will adversely affect the herd and the economic base it now provides. Other wildlife in the region will be similarly affected.

### Wild Horses

#### Present Status

A helicopter count made in August, 1974 in the Craig District indicated there are around 670 wild horses in the Northwest Region. They are disbursed as follows:

Douglas Mountain area	-	309, including	56 colts
Sand Wash Basin	-	141,	" 27 "
Piceance Creek Basin	-	105,	" 21 "
Douglas Creek	-	45,	" 5 "

In addition, Grand Junction District reports some 70 wild horses, including 13 colts, in the Bookcliffs area.

The count in Piceance Creek Basin and Douglas Creek was done under poor conditions and the actual number may be higher than indicated. It is estimated that the population of the herds is increasing 25-30% per year due mainly to the protective status provided by the Wild and Free Roaming Horse and Burro Act.

## Predicted Impacts

The law requires that the animals be protected. This may require that an area be set aside for their use and/or that some be transferred to other areas if their numbers increase beyond habitat capability. The increase in human activity in the area will adversely affect the free-roaming nature of the animals.

## Recreation

### Present Status

The most significant recreational value in the region is big-game hunting, mostly for mule deer and elk. Other recreational opportunities include fishing, bird hunting, skiing, snowmobiling, rock-hounding, sightseeing, and dude ranch activities. Archaeological ruins have recently been identified in Piceance Creek Basin but are not considered significant finds at this time.

### Predicted Impacts

The quality and ultimate value of the areas rich complement of recreational opportunities will be adversely affected by increased mineral development, increased population, etc., unless a comprehensive minerals development and monitoring plan is established to mitigate damages. Water quality, availability of food and people control will be particularly important in retaining the recreational advantages of the area.

## Water

### Present Status

The region is noted for its clear streams which provide high quality water for various purposes, such as domestic use, power generation, agriculture, recreation, fish habitat and industry. The Colorado and White Rivers are the main drainages of the region and are of the greatest concern as regards development. At the present time there is an excess of water in relation to use but this will change drastically as mineral development accelerates. A recent Interior study indicated that there may not be enough water in the area to accommodate all of the development plans. Many people in the area have stated that they do not intend to allow existing industries, such as farming and ranching to be "dried up" by the energy minerals industry.

### Predicted Impact

The long-term effect of industrialization in the region will cause a general decline in water quality with impacts focused on the White and Colorado Rivers. The degree of severity cannot be quantified at this time but will depend heavily on continuing research



and monitoring. In addition, there will be increased competition for use of water. Industry will require large amounts of water to produce energy minerals, plus additional amounts for power generation, and revegetation efforts. As the population of the region expands, there will be increased demands for water for urban and municipal uses. Land uses will probably change as water rights are acquired and diverted from uses such as agriculture to energy minerals production. Additional reservoirs will probably be built to meet the water demands of the region.

## Archaeology and Historic Resources

### Present Situation

Cultural resource values in the northwest region of Colorado are largely unknown since little work has been done on an area basis. Recent studies done in the Piceance Creek Basin indicate that the area has an extensive cultural resource but a great deal more needs to be done before its significance can be understood. To date, no significant archaeological, historic or scientific finds have been identified in the region, excluding of course, Dinosaur National Monument administered by the National Park Service.

The Fremont Indians are known to have inhabited the region but their nomadic nature, and disinclination to build impressive architectural structures makes it more difficult to inventory and understand their culture, as compared to the Anasazi culture that inhabited the Mesa Verde area.

### Predicted Impacts

Recent legislation (Public law 93-291, 88 Stat. 174, dated May 24, 1974) makes it mandatory to perform cultural examinations (archaeological, historical, paleontological) on "any Federal construction project or federally licensed project, activity or program". Since little is known regarding the cultural resource values of this region, it is anticipated that some developments will be delayed in the future due to a significant find or until a more thorough inventory can be made. Some cultural resource values will probably be destroyed either through mining activity or due to increased human activity in the region.

## Social-Economic

### Present Status

In the seven-county Northwestern region, the 1970 population was 100,837, an increase of 15% over 1960. While the proportion of families with incomes under \$5,000 was about the same as for the State (24.6% vs. 24.3% for Colorado) and the proportion of families under the poverty level was slightly lower than for the State (10.2% vs. 11.2% for Colorado), only 25.5% of the families, within the region, had incomes over \$12,000 in comparison with 41.9% for all of Colorado. These regional averages are increased noticeably by a

smaller number of higher income families residing in the resort areas.

Over the past 20 years the dependency of the area on agriculture as a source of employment and income has decreased substantially. Mining as a source of income and employment has decreased slightly and current projections of the mining sector indicate that mechanization will counter-balance increased production over the next year or two to provide few additional jobs and only modest increases in income.

Retail trade and other services presently account for a major portion of the income and employment in the region. Construction activities are based both on the building associated with the recreation-resort areas (condominiums, mountain homes and new stores, etc., in the principal resort communities) and the pivotal role that Grand Junction plays as the trade center for western Colorado and eastern Utah. Manufacturing in Grand Junction has increased somewhat over the past decade. The low rank of the wholesale trade sector is indicative of the fact that the region depends on Denver, Salt Lake and other major cities for primary, wholesale-supply activities.

Some parts of the region have become retirement-home areas for persons from outside the region as well as "havens" for those rural Coloradans removed from the recreation-development areas, either because of the associated higher living costs in the resort areas or their preference to live in quieter, rural communities.

To summarize, the history of the region is heavily tied to the agricultural and mining activities of the past. Mechanization has reduced the dependence on these sectors while a new recreation-tourism industry has grown up and attracted regional and national attention. Immigration of new people, new interests and Grand Junction's growing role as a regional trade and travel center have dominated the recent past.

#### Predicted Impacts

Increased energy minerals development would first and easily change the currently declining agricultural and mining based economy to an energy-mining based economy. While the recreation-tourism industry would continue to exist, tourism would likely be adversely affected if the region lost its rural, scenic charm.

Growth of existing or new communities would likely strengthen Grand Junction's role as a regional trade center, expanding the number and variety of services, facilities, products, etc., produced and offered.

The major impacts would be on the people and institutions now in the region. Construction of housing for construction and mine-operation workers would be a first order of business. Existing local firms, building trades workers and inventories of building materials would be inadequate. Sources of financing for the building phase would also likely be inadequate and require support from outside institutions or from public funds. The base facilities in the several area communities would likely be inadequate to meet growing demands for sewer, water, schools, and other public facilities. Sources of funds for these public facilities would also need to be developed, before the accompanying tax base grew adequately to provide for them.

The impacts on some local and regional firms ranging from materials suppliers to land speculators would no doubt be positive (in their view) yet costly to the new workers and their families. Considering the number of new people moving into the area, it is doubtful that services or facilities would be adequate to meet needs, at acceptable levels of quality. Some of the conditions might even be reminiscent of Gold Rush towns. Many people who had lived in the area, providing a major cultural resource and source of continuity and stability to the region would likely leave as have many from the Aspens, Steamboats, Vails, etc.

In spite of the need for comprehensive planning by all counties in the region, present evidence suggests a fragmented "can't-wait" approach based on speculation rather than solid information.

In conclusion, the magnitude of energy minerals development will spill into the very areas and towns now dominated by the recreation-tourism industry as well as the little agricultural and mining towns located along the Colorado, Gunnison, White and Yampa Rivers.



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